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M₂ Baroclinic Tides in the Indonesian Seas

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First Paragraph

Baroclinic, or internal, tides play a significant role in mixing in the deep ocean and in shallow seas (Munk and Wunsch, 1998; Garrett, 2003). In a stratified ocean, when the vertically uniform horizontal velocities of barotropic tides (tides in which surfaces of constant pressure are parallel to surfaces of constant density) interact with rough topography, disturbing isotherms and isopycnals, they generate baroclinic tides, for which the velocities are not vertically uniform. Currents, internal waves, and heaving isotherms resulting from baroclinic tides affect forces on structures and vessels. Vigorous internal tides have been observed in the Indonesian seas with isotherm excursions up to 90 m in the Ceram Sea during 14-hour yo-yo stations (Ffield and Gordon, 1996). Tides also affect the generation of mean currents and mixing. Mixing processes modify the ocean's hydrography, or physical characteristics, leading to density-driven flows. In the Indonesian seas, mixing transforms the Pacific inflow waters into Indonesian throughflow waters (Gordon, this issue) before export to the Indian Ocean. We used a tidal model to simulate the barotropic and baroclinic tides in the Indonesian seas to verify model performance against observations and to provide examples of baroclinic tidal activity.

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